



Briefing on Outage Management System Independent Verification and Validation Final Report (Phase 1 and 2)

June 28, 2023

STATUS OF PSEG LONG ISLAND OMS REDEPLOYMENT

PSEG Long Island redeployed CGI Outage Management System (OMS) v6.7.8 into production on February 6, 2022

- OMS v6.7 failed during Tropical Storm Isaias in August 2020
- Smart meter integration into OMS was deployed in June 2022. Performance (stress) testing on OMS-AMI integration was completed in September 2022
- PSEG Long Island reports that the system is functioning as expected
- The cost to remediate the OMS since its August 2020 failure exceeded \$47 million
- **LIPA IV&V Team consisting of LIPA internal staff and consultants initiated independent verification and validation (IV&V) of the system through review and testing**

TECHNICAL APPROACH

The overall objective of LIPA's IV&V is to reduce risk to LIPA and its customers. The IV&V undertook the following key activities:

- Meetings
- Interviews with PSEG Long Island staff and consultants
- Document Reviews
- Code Reviews
- Analysis
- Observation and Monitoring
- Functional Testing
- Performance (Stress) Testing

IV&V SCOPE

The overall objective of LIPA's IV&V is to reduce risk to LIPA and its customers. The specific scope of the IV&V review includes:

- Review of OMS design specifications, configurations, and interface implementations.
- Review of the design of PSEG Long Island's functional tests to ensure the tests are adequate to evaluate whether OMS v 6.7.8 complies with functional requirements.
- Running a sample of PSEG Long Island's functional tests to independently repeat and verify test results. Based on those sample results, running all of PSEG Long Island's functional tests until all tests were successful.
- Independent ad-hoc testing, including Positive Testing, Negative Testing, Boundary Value Testing, and End-to-End Testing.
- Review of custom code written by PSEG Long Island and its consultants, including the implementation of the asynchronous queueing mechanism (async queue) for the Enterprise Service Bus (ESB), and the duplicate outage detection logic.
- Monitoring and analysis of PSEG Long Island's performance tests.
- Review of PSEG Long Islands Performance Testing Storm Scenario and Data Model.
- Revise PSEG Long Island's Performance Testing Data Model to better capture expected storm scenarios.
- Independently run a Performance Test using the revised model.

FUNCTIONAL TESTING STATUS

The IV&V Team ran each of PSEG Long Island’s functional tests, sent failed tests to PSEG Long Island for resolution, and re-tested once PSEG Long Island reported the issue as fixed or provided updated test scripts, until the test could be closed:

	Test Points	Tests Run	Pass %	*Failed to Run %
July	535	358 (67%)	229 (64%)	129 (36%)
September	642	581 (90%)	279 (48%)	302 (52%)
November	646	616 (95%)	421 (68%)	143 (23%)
December	646	645 (99%)	451 (70%)	141 (22%)
January	646	645 (99%)	463 (72%)	118 (18%)
February	646	645 (99%)	483 (75%)	59 (9%)
March	645	644 (99%)	526 (82%)	12 (2%)
April	645	644 (99%)	527 (82%)	11 (2%)

- LIPA IV&V Team ran 645 tests and 527 eventually passed. 107 failed tests were removed by PSEG Long Island because the business identified them as obsolete. 11 tests remain pending because the current test environment is not set up to execute these scripts.

PERFORMANCE TESTING STATUS

In 2023, LIPA and PSEG Long Island conducted several performance tests with intermittent successes and failures:

Date	Test	Outcome
Jan 12, 2023	LIPA executed a dry-run performance test simulating Isaias conditions.	OMS call processing module failed and could not be recovered => Overall test failed
Jan 18, 2023	LIPA re-executed its dry-run performance test simulating Isaias conditions.	Test passed without major hiccups
April 26, 2023	IV&V 5-Hour Performance Smoke Test	Test passed
April 27, 2023	IV&V 5-Hour Performance Smoke Test	Test passed
June 14, 2023	90% Customer Out DPS Formal Performance Test	OMS call processing module failed again, but was re-startable by rebooting services

GENERAL FINDINGS

- Finding 1. Planning was deficient
- Finding 2. PSEG Long Island does not have sufficient internal technical resources
- Finding 3. Vendor Management was deficient
- Finding 4. Cost Control and Management was poor
- Finding 5. Test planning was deficient
- Finding 6. Test script development and management was deficient
- Finding 7. Test execution was deficient
- Finding 8. Requirements Management processes are inadequate
- Finding 9. Configuration and Release Management processes are inadequate

GENERAL FINDINGS (CONT)

- Finding 10. System and process documentation practices are poor
- Finding 11. The root cause of the failures during OMS was not concretely identified, but the risk of occurrence was mitigated
- Finding 12. Some performance tests have exhibited sporadic, non-reproducible and potentially critical issues

RECOMMENDATIONS

Governance

Recommendation 1: PSEG Long Island should develop clear and documented policies on IT systems governance. The application and enforcement of these policies must be the responsibility of PSEG Long Island staff, not consultants.

Recommendation 2: Business ownership of the systems should be guard-railed by clear and well-enforced policies

Training

Recommendation 3: PSEG Long Island should develop a comprehensive training program for its technical and line of business staff in the following areas:

- Technology project management
- Vendor management
- Requirements engineering and management
- Configuration management
- System documentation best practices
- Test management (including test design, scripting, automation, metrics and test environment management)

RECOMMENDATIONS (CONT)

Staffing and Employee Retention

Recommendation 4: PSEG Long Island should prioritize proactive employee recruitment strategies and reduce dependence on consultants by hiring more permanent staff

Recommendation 5: PSEG Long Island should be more proactive in employee retention

Vendor Management

Recommendation 6: PSEG Long Island should develop an enterprise-wide vendor management policy to establish clear performance expectations and accountability

Long term planning

Recommendation 7: PSEG Long Island should develop a long-term plan around the future of the current OMS system

RECOMMENDATIONS (CONT)

Process Improvements

Recommendation 8: PSEG Long Island should use formal tracking of problems (in one place) using ITIL practices

Recommendation 9: PSEG Long Island should automate functional testing. PSEG Long Island should embark on a test automation initiative that, initially, aims to automate a large portion of the regression testing scripts

Recommendation 10: PSEG Long Island should develop focused project management processes

RECOMMENDATIONS (CONT)

Business Continuity Plans

Recommendation 11: PSEG Long Island should expand on the current Business Continuity Plans to make sure that they are consistent with industry best practices

IT Quality Control and Assurance

Recommendation 12: PSEG Long Island should review all their existing functional test scripts and re-test each script until all the tests pass on a “repeatable” basis

Recommendation 13: PSEG Long Island should focus on improving test management practices, which will involve staff training and appropriate use of Software Development Life Cycle (SDLC) and test management tools

Recommendation 14: PSEG Long Island should ensure that system, integration, and user acceptance testing follows a defined cadence and is organized accordingly

NEXT STEPS

- **Review the findings and recommendations from this report with the Department of Public Service and return to the Board's next meeting for Proposed Board Recommendations, which would then be tracked until remediated**
- **PSEG Long Island should continue its efforts in identifying the root cause of the intermittent call processing defects within the OMS system**
- **LIPA IV&V Team will continue to monitor PSEG Long Island's progress in its effort to make OMS considerably more robust**



Discussion

Questions?